1,142,956

PATENT SPECIFICATION

DRAWINGS ATTACHED

1,142,956

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Int. Cl.:—B 05 b 1/32

COMPLETE SPECIFICATION

Distributor

We, U.S. STONEWARE INC., a corporation organized and existing under the laws of the State of Massachusetts, United States of America, of Worcester, State of Massachusetts, United States of America, do hereby declare the invention for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a distributor with orifices of extended flow range, for a gas- and liquid-contacting tower.

Contacting towers contain various types of packing to expose a large surface of the liquid which flows down through the tower, to the gas which rises in the tower. One or more distributors are usually provided within a tower to supply the liquid evenly over the entire cross section of the tower.

The volume of liquid supplied to a tower varies from time to time, and for this reason it has been difficult to cause a uniform distribution of the liquid over the entire cross-sectional area of the tower.

According to the invention there is provided a distributor for a packed contacting tower which comprises a closed flexible conduit with a plurality of small orifices in spaced relation along the length of the conduit, and valve means at each opening operable by flexure of the conduit due to variations of the pressure within the conduit to vary simultaneously the extent of the obstruction of the orifices by the valves.

The pressure within the conduit may range up to 5 pounds per square inch or more. At atmospheric pressure the orifices are closed or nearly closed by the valves, and at elevated ambient pressures the valves are lifted. The pressure is uniform throughout all of the conduits, so the valves are opened to a greater or less extent, varying the flow rate, simultaneously, throughout the one or more conduits of the distributor. By this arrangement the flow rate is the same through all of the orifices at all times, although it may vary from time to time, and uniform treatment of the liquid and gas throughout the whole cross-sectional area of the tower is assured.

A specific embodiment of the invention will now be described by way of example with reference to the accompanying drawing, in which:—

Figure 1 is a view in perspective of a preferred form of distributor;

Figure 2 is a bottom view of this distributor;

Figure 3 is an enlarged sectional view on the line 3—3 of Figure 1;

Figures 4 and 5 are sectional views on the line 4—4 of Figure 1, on a much enlarged scale, showing the valve closed and open, respectively; and

Figure 6 is a section through a tower showing the distributor installed in it.

It is not necessary that the distributor be of the ladder type. The conduits may be arranged according to any suitable configuration. The conduits must be flexible and may be made of metal or plastic. They must be closed.

The distributor shown comprises a single feeder conduit 1. This is made in sections, the flanges 3 of which may be readily bolted together after the sections have been brought into the tower. Alternately this feeder conduit may be in one piece. Figure 6 shows a tower 5 with the feeder conduit 1 bolted to the flanged feeder pipe 6.

Each branch conduit 8 is provided along its bottom with orifices 10. Each screw 12 is threaded into the top of the branch conduit 8, and washers 14 are provided of just the right height so that the bottom of each screw just seats in its opening (Figure 4) or, alternatively, so that the bottom of each screw is spaced the same minimum distance from the opening. As the pressure on the liquid in-

[*Price 4s. 6d.*]

creases, the pipe becomes rounder (Figure 5) opening the valve or increasing the amount it is opened, thereby increasing the flow rate through all orifices as the coduit is inflated. It decreases on deflation of the conduit.

Velocity-retarder tubes 18 convey liquid away from the orifices into the bed. Adjacent tubes are advantageously faced in opposite directions to spread the liquid over the bed 20. Figures 2 and 3 show how extra tubes 18 are located near the feeder conduit to direct liquid under the conduit. Although such velocity-retarder tubes are not essential, it is desirable to provide them not only in order to assist in directing the liquid to all parts of the bed, but also to minimize splashing of the liquid because of their velocity-retarding effect. Splashing creates an objectionable spray of liquid which may be carried up through the tower.

The following illustrates how the valves function, but is purely exemplary. If, at a liquid pressure of one pound per square inch throughout the system, a valve opening 25 is the equivalent of an orifice 1/16 inch in diameter, it will deliver about 0.08 pound per minute of liquid. Assume that at 20 pounds per square inch liquid pressure the opening is increased to the equivalent of an orifice 1/8 inch in diameter (because of inflation of the tube, which raises the screw), and this will deliver 1.4 pounds per minute of liquid. This gives a flow ratio of 18:1 over a pressure ratio of 20—1. If the variable flow were not used, the flow of liquid would be about 0.3 pound per minute at one pound per square inch and the flow ratio would be only 4.5:1 over a pressure ratio of 20:1.

Furthermore, the opening and closing of the valves is a desirable method of dislodging any matter which tends to foul the orifices.

WHAT WE CLAIM IS:—

1. A distributor for a packed contacting tower which comprises a closed flexible conduit with a plurality of small orifices in spaced relation along the length of the conduit, and valve means at each opening operable by flexure of the conduit due to variations of the pressure within the conduit to vary simultaneously the extent of the obstruction of the orifices by the valves.

2. A distributor as claimed in claim 1, in which the conduit is a flattened cylinder, the orifices are in the bottom of the conduit, and each valve means is attached to the top of the cylinder and extends toward the opening and adjacent to it.

3. The distributor as claimed in claim 1 or Claim 2 in which a velocity-retarder tube surrounds each orifice on the exterior of the conduit and extends away from the opening.

4. A section of a ladder distributor which comprises an enclosed feeder conduit section which is open at each end, with each end provided with an outwardly extending flange, at least two closed flexible branch conduits extending outwardly from opposite sides of the feeder conduit, each of said feeder conduits being a flattened cylinder with spaced orifices throughout its bottom, a screw threaded into the top of each feeder conduit above each orifice with the screw bottom serving as a valve to vary the rate of flow of liquid through the orifice as the conduit is inflated and deflated, and a washer under the head of each screw which spaces the bottom of each screw in a desired relation to its associated orifice.

5. A liquid-gas contacting tower with the distributor of any one of claims 1 to 3 therein, and means for supplying liquid to the distributor under pressure.

6. A liquid-gas contacting tower with a distributor therein which comprises a plurality of sections as claimed in claim 4 therein, bolted together, and means for supplying liquid to the distributor under pressure.

7. A distributor for a packed contacting tower, substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

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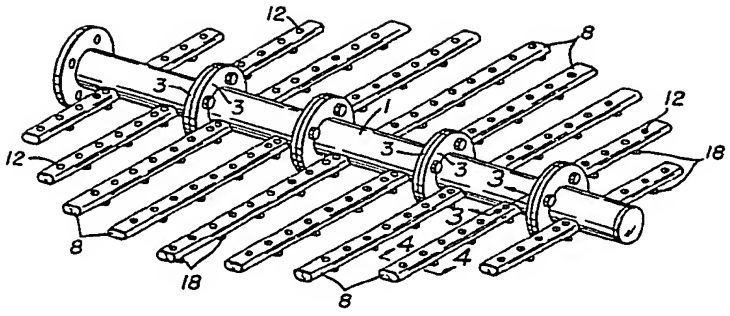


FIG. 1

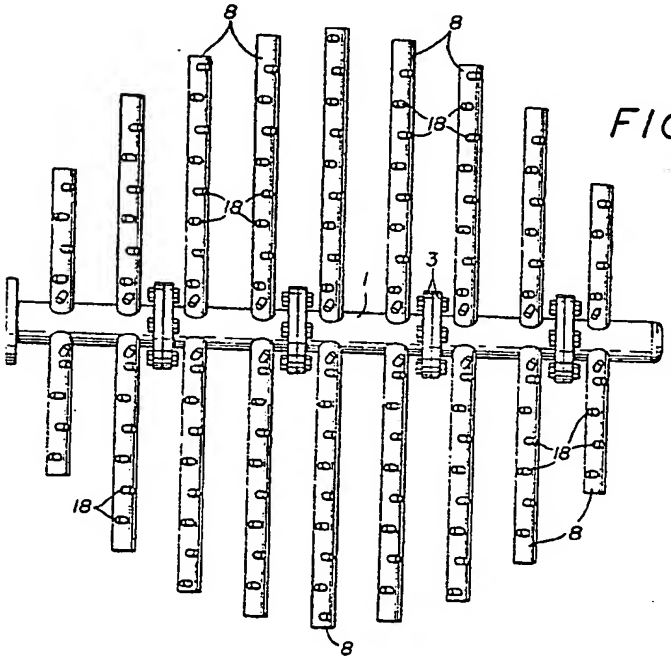
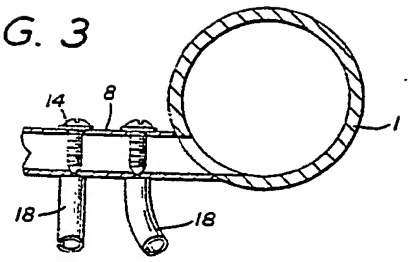


FIG. 2

1142956 COMPLETE SPECIFICATION
2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheets 1 & 2

FIG. 3



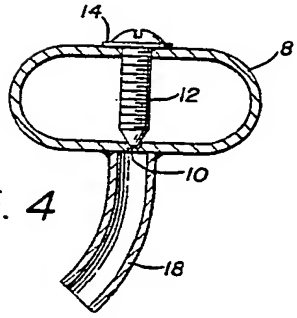


FIG. 4

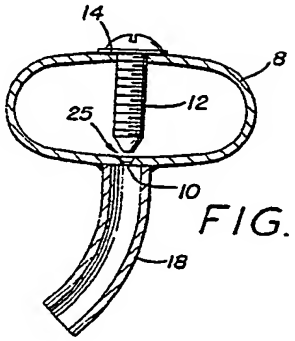


FIG. 5

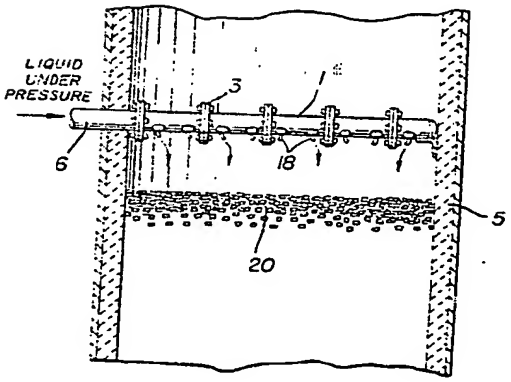


FIG. 6

1142956 COMPLETE SPECIFICATION
2 SHEETS This drawing is a reproduction of the Original on a reduced scale
Sheets 1 & 2

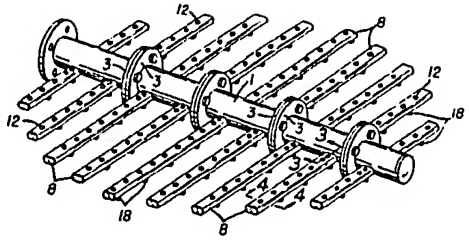


FIG. 1

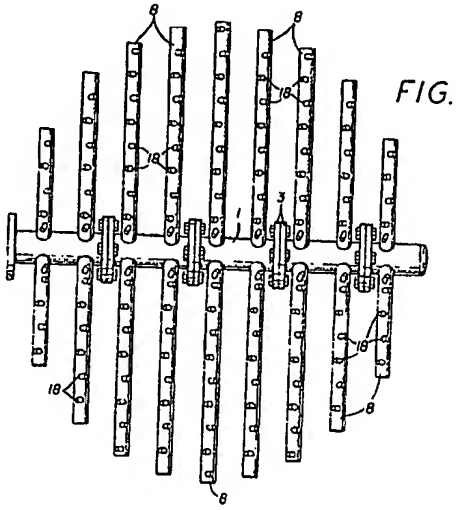
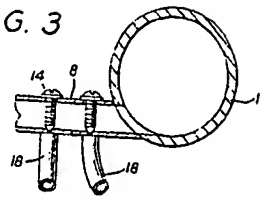


FIG. 2

FIG. 3



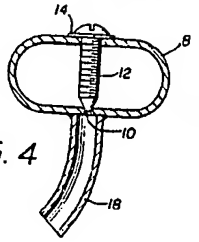


FIG. 4

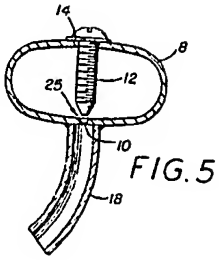


FIG. 5

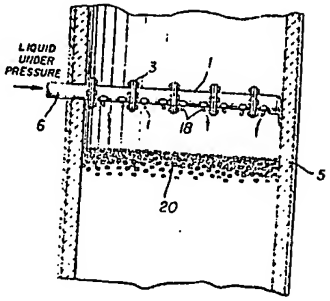


FIG. 6